

to five each with a similar mark occupying the apical two-thirds of the segment; segments six to eight with a conspicuous black ring as in *N. unicingulata*, this including all of segments six to eight excepting the basal half of the sixth sternite, which is orange; sternites unmarked. Hypopygium reddish orange; ninth tergite with a broad, rounded posterior notch; outer pleural appendage tapering to a long point.

The female is generally similar to the male, but the occipital mark is less distinct, the præsental stripes confluent, the scutellum and posterior margin of the postnotum darker brown, the pleural markings darker. The tergal valves of the ovipositor are long and straight.

Hab. Rhodesia (Melsetter District).

Holotype, ♂, Chirinda Forest, October 1905 (*G. A. K. Marshall*).

Allotopotype, ♀.

Type in the collection of the British Museum.

Nephrotoma mossambica is closely related to *N. unicingulata*, Alexander (Transvaal to Cape Colony), in the cingulated abdomen and the apically pubescent wings. It is readily told by the much more extensive black areas on the mesonotum, the darker legs, the darker wings with the sector short and straight, and by the narrow black markings on abdominal tergites one to six.

XLVIII.—*Notes on certain British Freshwater Entomostraca.*
By ROBERT GURNEY, M.A.

THE following notes refer to a few species taken during the past summer, mainly in Norfolk, some of which have not previously been found in Britain:—

1. *Chirocephalus diaphanus* (Prevost)*.

On Sept. 12, 1919, I found a number of specimens of the Fairy Shrimp in a small pool on Bratley Heath by the

* Daday, in his "Monograph of the Phyllopoda Anostraca" (*Ann. Sci. Nat.* xi. 1910, p. 206), adopts the specific name *stagnalis*, Shaw. As a matter of fact, Shaw is antedated by King (1767), but in either case the name is inadmissible for this species under Article 31 of the Rules of Nomenclature (see *Int. Rev. Hydrob.*, Suppl. vi. 1914, Heft 2). Had it not been so, there would be three species in closely-allied genera to all of which the same specific name might be attached. Fortunately, only one of them (*Tanymanix stagnalis*, Linn.) can properly claim that name.

Lyndhurst-Ringwood road. There are several small ponds along this road within a short distance of each other, but this one alone contained the *Chirocephalus*. All the ponds have a gravel bottom covered with grassy weed, and the only respect in which the pond in question differed from the others was in the presence of a thick growth of *Polygonum hydropiper*. None contained Cladocera of any kind, but, whereas the other ponds examined produced only *Diaptomus castor* and *Cypris virens*, the *Chirocephalus* was accompanied by *Cyclops agilis* and *C. vicinus*, *Diaptomus vulgaris*, and *Cyprinotus incongruens*.

The first record of the occurrence of *Chirocephalus diaphanus* in Britain is that of King, who found it near Norwich in 1762. Baird, in 1850, was able to give several records of its occurrence, and in 1862 it was found by Mr. A. Brady at Tillmire, near York. From that date till 1891 it was apparently not met with, but since then it has been seen in about twenty places, nearly all in the South of England. It is possible that the absence of records of the occurrence of *Chirocephalus* (with the exception of that of 1862) from 1850 till 1891 may be due to lack of search for it, but it seems more probable that it actually disappeared in the same way as *Apus caucrisiformis* became extinct. The latter appeared again in 1907, but did not establish itself; whereas it seems that *Chirocephalus diaphanus* has not only re-established itself, but is becoming comparatively common.

Its most northern locality in England corresponds almost exactly with its northern limit (50° N. lat.) in Europe, and its range extends South to the maritime regions of Algeria and Tunisia. It does not, so far as I know, occur in the Hauts Plateaux of Algeria or at Biskra. Daday quotes my authority for its occurrence at Biskra, but this is an error on his part, as the only species found there by me was *Branchipus pisciformis*, Schaeffer.

Chirocephalus diaphanus ranges in size from 37 mm. down to 12 mm., and Simon* states that there are two distinct races—a large and a small—which do not intermingle. My specimens from Bratley Heath, though fully mature, measure only about 16 mm., but much larger specimens occur in this country. I have a female, taken in Cornwall, of 30 mm., and Mr. Scourfield informs me that he has one from Christchurch nearly 34 mm. long, though the largest specimens from Claygate do not exceed 19 mm. Both races are recorded by Simon from North Africa, and I have

* Ann. Soc. Entom. France, ser. 6, vi. 1886, p. 397.

found the large race (exceeding 20 mm.) the commoner in Tunisia; but on one occasion the specimens taken in a small rain-pool near Tunis included both large and small individuals, and were separable into three groups. Out of 15 males measured, 12 ranged from 24 to 22 mm., two were intermediate (19 and 16 mm.), and one very small (12 mm.). The species is found both in muddy temporary pools—such as cart-tracks at Claygate—and also in clear, weedy water as on Bratley Heath. Brauer gives it as an example of a Branchipod of clear water, associated commonly with *Lepidurus apus*, as compared with *Branchipus pisciformis*, Schaeff., which is found in muddy places in company with *Apus cancriformis*; but this distinction does not hold good in my experience, since in Tunisia it was generally found in muddy pools, and more than once in company with *Apus cancriformis*. Brauer has also pointed out that the association with *Apus* and *Estheria* is of direct benefit to the Branchipods, since *Apus* and *Estheria* stir up the mud and so distribute food. It seems to me that there is no dimorphism in the case of *C. diaphanus*, but that the size of the individuals depends on the conditions of existence, the larger form being generally found in muddy places rich in food and the smaller in clear water.

In France, where *C. diaphanus* is common, it appears first in March, and commonly disappears in summer owing to the drying up of the pools. In this country it has been recorded in almost every month in the year, but Mr. H. J. Waddington's observations* show that, near Christchurch, it appears between January and March, disappears in summer, and reappears again for a time in autumn. The notes which Mr. Lucas has kindly sent me of its occurrences at Claygate seem to prove the same kind of cycle, but I do not think that the history of any colony has ever been completely followed throughout the year. The eggs of *C. diaphanus*, unlike those of most other Phyllo-pods, do not require to be dried before developing, though they can, of course, resist desiccation. Brauer states that, when they remain in water after being laid, they have a resting period of some months; and the individuals appearing in autumn would, therefore, be derived from the eggs laid in spring. On the other hand, Shaw, who gave an interesting account of his observations†, states that eggs laid by a female isolated in an aquarium hatch in about a fortnight; and it seems that further

* Journ. R. Mic. Soc. 1913, pp. 250-254.

† Trans. Linn. Soc. i. 1791, pp. 103-110.

investigation of the life-history of this, our only remaining British Phyllopod, are required.

CLADOCERA.

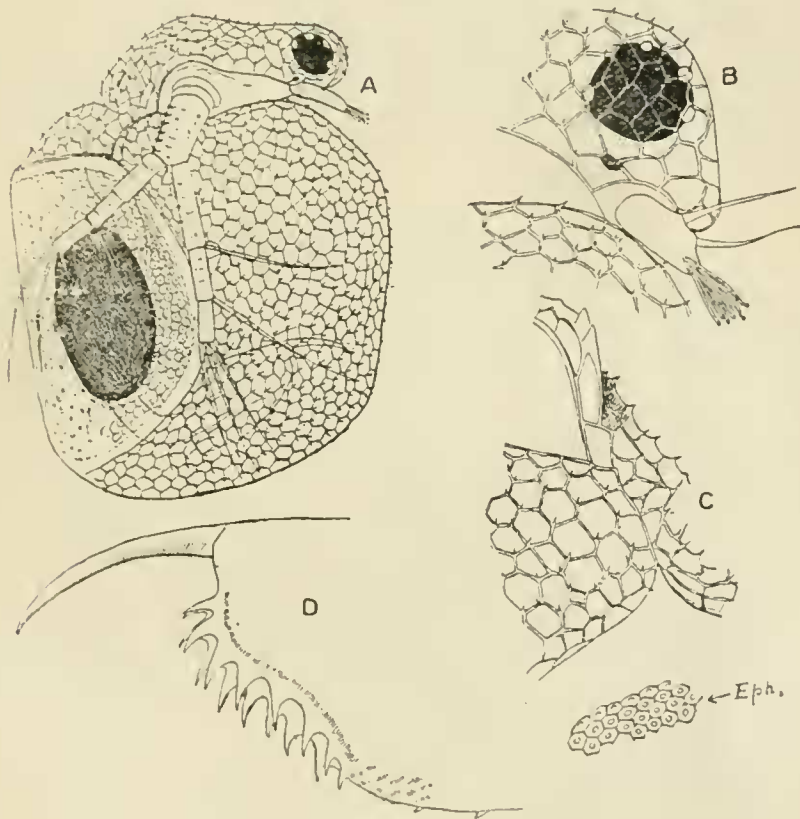
The two species mentioned below were both found during August and September 1919 on East Ruston Common, three miles north-west of Stalham, in East Norfolk. At the spot where I have made my collections the marsh is crossed by a road at its narrowest part, and on the south of the road is a bog which is always under water. There is a rich vegetation of the usual fen type, with a dense growth of *Hypnum* below the water, with which is mingled *Utricularia minor* and *intermedia*. The presence of *Chara* in a pool in the marsh indicates a calcareous water. The Entomostracan fauna is of remarkable richness, and differs in several respects from that of any waters with which I am acquainted. Twenty-four species of Cladocera and twenty of Copepoda have been found in a small space of a few square yards, besides several Ostracoda; while some of the species are extremely rare in other parts of the district, but occur here in considerable numbers—for example, *Metacypris cordata*, *Cypris fasciata*, *Candona euplectella*, *Cyclops nanus*, and *Canthocamptus northumbriensis*. The two species, *Ceriodaphnia setosa* and *Kurzia latissima*, were found only in this one small spot and not elsewhere in the marsh.

2. *Ceriodaphnia setosa*, Matile. (Fig. 1.)

A few specimens of this peculiar *Ceriodaphnia* were found in a collection made on Aug. 26 in moss under a depth of about six inches of water. I returned to the spot two days later with the intention of obtaining more material, but was again rewarded only by a very few individuals in spite of exhaustive search, and was not able to ascertain in what kind of situation it was living. Its almost entire absence from collections made in the clear open water seems to show that it lives actually among the moss, whereas *C. laticaudata*, which was also present at the same time, was commoner in the open water. *C. setosa* is a sluggish swimmer, and is easily distinguishable from the usual red form of *C. laticaudata* by its whitish colour faintly tinged with rose; but this character is not altogether distinctive, since I have found *C. laticaudata* in abundance in a similar situation at Sutton Broad, every individual being of exactly the same colour as *C. setosa*. In fact, I supposed at the time that I had found a new habitat for the latter.

C. setosa is characterized by the presence of small spines all over the body, these spines springing from every node of the conspicuous reticulations of the shell and head. Lilljeborg states that, in the male, they do not arise from the nodes only, but I have not found any difference between the sexes in this respect. Similar spines are described in *C. echinata*, Moniez, and in *C. acanthina*, Ross, but in the former the postabdomen is even broader than that of

Fig. 1.

*Ceriodaphnia setosa.*

- A. Ephippial female.
- B. Head of male.
- C. Fornix and margin of ephippium of female.
- D. Postabdomen of female.

C. laticaudata, and in the latter the front of the head is said to be smooth, while the postabdominal claws are denticulate.

The ephippium is marked off from the valves by a broad, clear space which is free from reticulations, and the ephippium itself is covered with small reticulations, each with a small knob or boss in the centre, but with no spines.

The first pair of antennæ of the female are longer and more slender than in *C. laticaudata*, and the postabdomen is not so broad. The male is readily distinguished by the protuberance of the rostral region of the head.

So far as I am aware, *C. setosa*, which was first described in 1890 from specimens taken in the neighbourhood of Moscow, has since that time only been recorded from Sweden and from Plön, in Holstein. Prof. Lilljeborg states that it is very rare in Sweden, though widely distributed, being found in places with rich vegetation, particularly Lemna, in company with *C. laticaudata* and *C. rotunda*. The latter has never been found in this country since 1850, when Baird described it in his 'Natural History of British Entomostraca,' and it is very probable that his description refers to *C. laticaudata*.

3. *Kurzia latissima*, Kurz.

This species was found for the first time on Aug. 26, and was common on that day in a small patch of Hypnum, which reached to the surface of the water. This patch was little more than a yard in diameter, and the *Kurzia* were almost confined to it, since none were found in the surrounding marsh. On subsequent days occasional specimens were taken in the neighbourhood of this spot, but the species rapidly decreased in numbers, and only two individuals were found on Oct. 7 in spite of assiduous search.

Kurzia latissima is a rare species, but has an extremely wide range, being recorded from Sweden, Bohemia, Russia, Switzerland, Brandenburg, Central Asia, United States, Paraguay, Brazil, and Argentina. It is readily distinguishable by its broad outline and its very narrow postabdomen. The ephippial area is not marked off from the rest of the shell by a "line of weakness," but is dark brown in colour and marked with fine brown dots. The male differs little from the female either in shape of shell or of postabdomen.

COPEPODA.

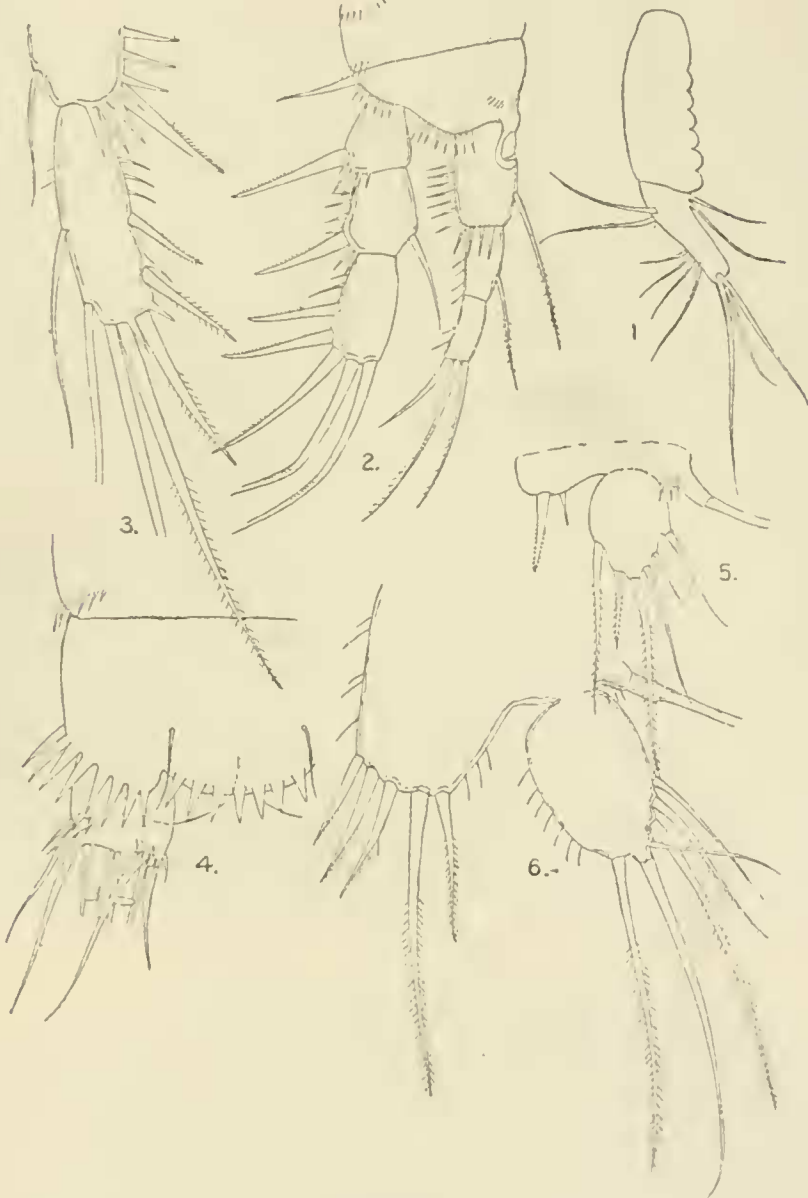
4. *Nitocra simplex*, Schmeil. (Fig. 2.)

Syn. *N. mulleri*, Van Douwe, Zool. Anz. xxviii. 1905, p. 434.

Nitocra hibernica (Brady) is widely distributed in the Norfolk Broads, both in those which are quite fresh and also in the rather brackish waters of the Hickling region; and *N. spinipes*, Boeck, is also found, though rarely, in the

estuarine region of the rivers and near the coast. This year I have found *N. simplex*, Schmeil, also in Horsey Mere and

Fig. 2.



Nitocra simplex.

1. First antenna of male, last two joints.
2. First leg of male.
3. Third leg of female, last joint of external branch.
4. Furca and operculum of male.
5. Fifth foot of male.
6. Fifth foot of female.

Hickling Broad, but I have only met with it in decayed stems of *Typha angustifolia* when searching for *Horsietella*

brericornis (Van Douwe). It occurs in these stems in fair numbers, and can generally be distinguished from *N. hibernica*, with which it is associated, by its smaller size and absence of brown markings. This distinction in colour does not always hold good, since, on the one hand, Van Douwe notes strong pigmentation in his examples, and, on the other hand, *N. hibernica* may sometimes be quite colourless. Structurally *N. simplex* is most closely allied to *N. spinipes*, Boeck *, but differs from it in the structure of the first and fifth feet and of the prehensile antenna of the male. The penultimate joint of the latter in *N. simplex* has a series of small knobs along its inner edge, which are not found in any other species of the genus. In some males of *N. hibernica* this joint has a few cuticular ridges, which indicate an approach to the condition found in *N. simplex*.

Nitocra simplex appears to be confined to waters in which there is an appreciable quantity of salt present. Schmeil found it in Holstein, in water having a salinity of $\cdot 5\%$, while Thienemann † records its occurrence in water with a salt content of about 2.5 gm. per litre. In Hickling and in Horsey Mere the salinity varies between 40 and 70 grains per gallon. I have found specimens in a collection made in 1899 at Cley, in Norfolk, in a ditch close to the sea in which the water was probably slightly brackish, though it contained otherwise only freshwater Entomostracá.

The genus *Nitocra* seems to be characteristically marine, and *N. simplex* holds an intermediate position between such species as *N. spinipes* which is found only in water of high salinity and *N. hibernica* which is a genuine freshwater species.

5. *Mesochra rapiens* (Schmeil).

Apsteinia rapiens, Schmeil, Zeits. Naturw. lxxvii. 1894, p. 348.

Canthocamptus hirticornis, Scott, 13th Ann. Rep. Scottish F. B. 1895, p. 251.

Canthocamptus megalops, Lilljeborg, K. Sv.-Ak. Handl. xxxvi. 1902, p. 30.

Apsteinia rapiens, Van Douwe, Deutsch. Susswasserfauna, 1909, p. 61.

Mesochra hirticornis, Sars, Crust. of Norway, v. 1911, p. 210.

The identity of *C. megalops*, Lillj., with *Mesochra hirticornis* has already been pointed out by Dr. Scott and accepted by Prof. Sars, but a comparison of the description of Schmeil and the figures given by Van Douwe of *Apsteinia rapiens*

* I refer to *N. spinipes*, as described by Sars (Crust. of Norway, v. p. 213). With this species *N. palustris* (Brady) is synonymous.

† Verh. Deutsch. Zool. Ges. Vers. xxiii. 1913.

with Dr. Scott's description and figures of *C. hirticornis* leaves no doubt that both were dealing with the same species. As Schmeil's name has priority, it is unfortunate that the specific name of *hirticornis* must give way to that of *rapiens*. Prof. Sars is undoubtedly right in including the species in the genus *Mesochra*.

Mesochra rapiens is fairly common in the Norfolk Broads, where the salinity is high (*e. g.*, Hickling and Horsey), and I have also found it at Flordon Common, near Norwich. The water there is perfectly "fresh," but is highly calcareous, and my specimens were found in greyish calcareous mud, covered only by a mere film of water. It occurs also in Oulton Broad, in Suffolk, since a slide in Dr. Brady's collection, labelled "*Canthocamptus palustris*, Oulton Broad," contains, besides several *C. palustris*, also two specimens of *Mesochra rapiens* and one of *Tachidius littoralis*, Poppe. This slide was probably made before the year 1880.

M. rapiens has been found by Dr. Scott in various parts of Scotland (Outer Hebrides, Loch Tarbert, Forth District, Loch Lomond, and R. Ythan, Aberdeenshire), often in brackish water and always not far from the sea. In the Baltic it has been recorded from Colberg by Schmeil in water of a salinity of $\cdot 5 \text{ ‰}$, and by Lilljeborg from the Baltic coast and from the Ekoln branch of Lake Mälaren in fresh water. Prof. Lilljeborg suggests that it may be regarded as a relict in Lake Mälaren of a former extension of the Baltic. The Ekoln is known to contain other Crustacea which are supposed to be relicts of such former extensions*. In Norway the species has only been taken in a brackish pool in the South.

6. *Tachidius brevicornis*, Lillj., in fresh water.

Mr. Seourfield † has drawn attention to the small pools of water which collect at the roots and in holes in trees as the habitat of Entomostraca, and has described a new species, *Moraria arboricola*, which inhabits such pools in Epping Forest. In Epping Forest the pollarding of the oaks has provided innumerable water-holes, but I found, during a visit to the New Forest in August 1919, that the only collections of water there were in beech-trees, either at the roots or in the hollow in the fork between two main branches, though there were other holes which had at one time contained water, but were then dry. *Moraria arboricola* proved to be common, occurring in the majority of the pools,

* Ekman, Zool. Stud. tillägn. T. Tullberg, 1907.

† Journ. Quekett Mic. Club, (2) xii, 1915, p. 431.

but my experience was that Entomostraca seldom occurred in those pools in which the water was foul from decaying leaves. Generally, however, the water is very pure, and a kind of fine peat is deposited by slow decay of the leaves, as has been described by Picado*. Contrary to Mr. Scourfield's experience, I found other species, both of Cladocera and of Copepoda, in these holes, though *M. arboricola* was the only species met with as a rule. For instance, in one hole the following species were found, in addition to *M. arboricola*:—*Alona affinis*, *Chydorus ovalis*, *Chydorus sphaericus*, and *Canthocamptus pygmaeus*, while another large hole contained only *C. pygmaeus* in abundance. On one occasion a few specimens of *Candona pratensis*, Hartw., were met with in a hole near Burley †.

The most remarkable discovery, however, was made in a pool at the root of a beech-tree at Burley. In this pool were a number of *M. arboricola*, and among them were three specimens of *Tachidius brevicornis*, Lillj.—two young and an egg-bearing female. The occurrence of this littoral and brackish-water species in such a situation is extraordinary and unaccountable, since the water in these holes must be pure rain water, and Burley is over six miles from the sea. In the East Norfolk rivers, where there is a mingling of marine forms with those from fresh water, *T. brevicornis* has never been found beyond the reach of salt water, though *T. littoralis*, Poppe, penetrates sometimes into quite fresh water. No chemical analysis of the water in these tree-holes has been made, but it is possible that it may become rather highly concentrated by evaporation without drainage. That is a question which might be worth investigation.

XLIX.—On Neotropical Bats of the Genus *Eptesicus*.

By OLDFIELD THOMAS.

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THE Neotropical species of the widely-spread genus *Eptesicus* are almost all members of the group of which "*E. hilairci*" (using for the moment the name best known for it) is typical—small delicately built bats quite different from the large heavily built *E. fuscus* of North America. The group represented by the latter, however, not only goes into Central

* Bull. Sci. France Belgique, (7) xlvii. 1913, pp. 215-360.

† E. Simon, Ann. Soc. Entom. France, (6) vi. 1886, p. 415, alludes to the occurrence of *Tanymania stagnalis*, Linn., in hollows in tree-roots.